HM SERIES

HM MEGOHMMETERS

MODEL NOS. *HM1, HM3A, HM6B,
HM3AS, HM6BS, HM6C

USER'S GUIDE

* schem only

Hipotronics inc.

applied high voltage technology for industry utilities & science

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SCOPE

This publication describes the Hipotronics HM Series of Megohmmeters. It is intended to provide a simplified reference for users of this equipment, and allow them to make use of its features quickly, safely and efficiently.

Information in the body of this publication applies to all six models in the HM Series. Information pertinent to the specific model purchased is provided in the pocket of the back cover of the publication. This includes an electrical schematic and a parts list.

The publication contains four major sections: General Description, Calibration Instructions, Operation Instructions and Special Operations.

The General Description section describes the major features of the models in the HM Series, and also contains a description of the functions performed by each of the controls and indicators.

The Calibration Instructions section provides step-by-step instructions for stabilizing the unit before operation.

The Operation Instructions section provides step-by-step instructions for performing Insulation Resistance Testing.

The Special Operations section describes the procedures involved in Meter Recalibration and Trouble Shooting.

REFERENCES

It is assumed that the user has a basic understanding of the handling of electrical equipment and the major functions to be performed by the equipment to be used. An outline of the functions, features and specifications of the Hipotronics HM Series of Megohmmeters is provided in Hipotronics Brochure Number HP7107. Valuable information is also contained in the American Society for Testing Materials (ASTM) standards and specifications D257.

GENERAL DESCRIPTION

This section is intended to acquaint the user with the major features of the models in the Hipotronics HM Series, and the functions performed by each of the controls and indicators on the control panel.

Features and Specifications.

The Hipotronics HM Series consists of six high voltage megohmmeters. Resistance from .1 to 20,000,000 megohms is indicated directly on the front panel.

These units are capable of precise measurement of resistance in a variety of components and insulations.

All models are engineered for maximum equipment and operator protection. Surge devices built into the equipment preclude injury to any component from repeated short circuits at full output.

Model No.	Output Voltage	Megohm Range	Megohm Ranges
HM1	500	1 to 1,000	2
HM3A	50	0.1 to 1,000,000	6
	100	0.2 to 2,000,000	6
	500	1 to 10,000,000	6
	1000	2 to 20,000,000	6
HM3AS		Same as HM3A but with 2 hand operation	
HM6B	50	0.1 to 1,000,000	6
	250	0.5 to 5,000,000	6
	500	1 to 10,000,000	6
HM6BS		Same as HM6B but with 2 hand operation	
HM6C	250	0.1 to 1,000,000	6

All units operate from an input of 115 volts ac, 50/60 Hz
3 Amperes: rated output current is 5 mA.
Features include:

- a meter multiplier with several positions for range selection
- ferro-resonant line and solid state electronically regulated test voltage
- dual color meter scale
- four terminal output network for grounded or ungrounded testing
- self contained precision calibrating resistors

Controls and Indicators

The function and use of the various controls and indicators are described below.

TEST VOLTAGE

The TEST VOLTAGE dial, located in the upper left corner of the control panel, selects one of four output voltage ranges from 50-1000 volts. The negative output should always be disconnected before the TEST VOLTAGE position is switched.

The Model HM1 has a regulated test voltage of 500 volts.

MEGOHMMETER

The megohmmeter located in the upper right window of the control panel, measures resistance in megohms on the scale.

The black meter markings above the scale indicate resistance in a LOW range (1-100 megohms). The HIGH range is designated by the red numbers below the scale (5-500 megohms).

The megohmmeter indicator should be at "500" when the unit is OFF. If not,minor adjustments may be made only when the HV control is OFF via the adjusting screw below the meter window.

MULTIPLIER

All the HM units (except the HM1) have six positions on the multiplier dial for selecting low and high ranges in multiples of ten ($X.01-X10^5$).

The multiplier control allows for resistance readings in three ranges when performing insulation testing. To obtain the proper reading from the megohmmeter, simply multiply the reading on the scale by the value indicator at the range to which the multiplier is set.

EXAMPLE: In performing an insulation resistance test, the megohmmeter indication is "4" on the megohm scale, with the MULTIPLIER control set at "X100". The proper reading is therefore, 400 megohms.

NEGATIVE POST

The NEGATIVE POST on the lower section of the control panel provides the high voltage to the test sample. The negative output should always be disconnected before the test voltage selector is switched to a different range.

GROUND - GUARD - POSITIVE FRONT PANEL CONNECTIONS

There are three plug-in connection posts on the front panel labeled GUARD, GROUND and POSITIVE. The GUARD or POS posts are always connected to GROUND by a jumper link whenever testing. An explanation of these two connection combinations follows:

1 - Jumper link connected between GUARD and GROUND Post

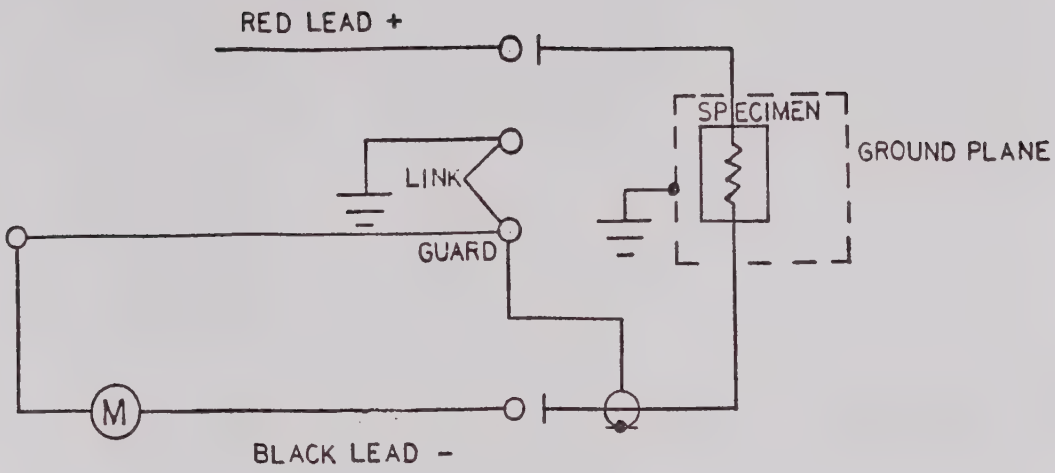
The sole function of this mode of operation is to separate the paths of two types of current flowing. These currents are: current flowing along the isolated insulator being tested which we want to monitor and corona leakage current flowing through the air to ground which we do not want to monitor. With a grounded GUARD hook-up all leakage current flowing directly to ground will be by-passed around the current meter and therefore not observed. Only leakage current flowing along the insulator will be observed and accurately measured by the current meter. The red test lead acts as a return between the POS terminal and the test sample.

2 - Jumper link connected between GROUND and the POS post

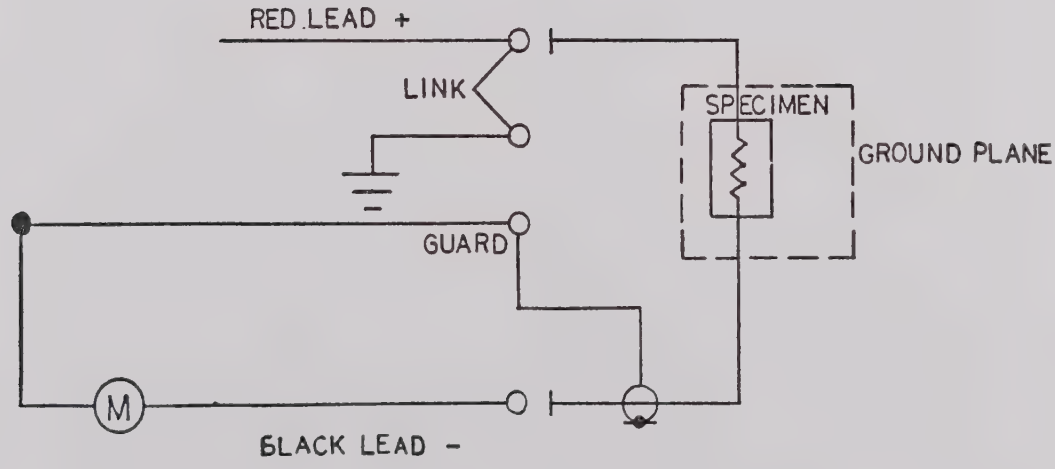
This front panel hook-up connection will only be used when sensitive leakage current measurements are not necessary. The current paths are not separated in this configuration therefore all current is observed upon the meter.

AC ON Button

The AC ON button activates the unit input. The unit should be warmed up for 20 minutes before operation.



Example 1. Red lead is at high voltage and the black lead acts as the metering current return.



Example 2. Red lead is grounded and black lead and guard are at high voltage.

For Manual Models Only:

CHARGE SWITCH

This switch supplies the charge to the test sample through the output cable. The cable should be charged before the TEST SWITCH is depressed. This procedure should be used primarily with capacitive loads.

TEST SWITCH

This spring-loaded toggle switch activates the output power and acts as a safety feature.

HIGH AND LOW STABILIZING CALIBRATION

Every unit except the HM1 should be stabilized before measurement of the test sample. Since leakage across the binding posts (Ground, Positive, Guard) may affect this calibration, clean the binding posts thoroughly and ground the GUARD according to the desired operation (see the GUARD circuit explanation for details).

1. Make sure that the VOLTAGE SELECTOR switch is in the OFF position before connecting the instrument to an 117 volt, ac power input. Turn the power ON and allow 20 minutes for the unit to warm up before calibration.

2. Select the desired voltage range with the TEST VOLTAGE control.

3. The multiplier should be set on the X1 position of the outer "H CAL" calibrating scale.

4. The CHARGE and TEST switches on the manual models have to be depressed to activate the meter.

5. Adjust the front panel potentiometer below the megohmmeter if the "H" on the megohmmeter does not correspond to the "H CAL" position on the multiplier scale.

6. Set the multiplier switches to the "L CAL" position and adjust the "SET L" control for the "L" range on the megohmmeter scale. Always calibrate "L" when the TEST VOLTAGE switch is in the desired voltage position.

7. Double check the calibration pots after both have been read in the desired range.

8. Turn the TEST VOLTAGE dial to the OFF position.

   * The zero shift adjustment of the megohmmeter scale should be checked periodically. (see Special Operations section for details)

OPERATION INSTRUCTIONS

If the approximate resistance of the test sample to be measured is unknown, the procedures described below should be followed.

1) Set the TEST VOLTAGE switch to off. The MULTIPLIER switch should be set to the lowest range position.

2) Connect the high side of the test sample to the black negative output terminal on the unit and the red ground terminal should be connected to the low side of the test sample.

3) Set the TEST VOLTAGE to the desired position.

   * The negative output must be removed before the test voltage is switched to a different voltage. The HIGH (H) and LOW (L) calibrating ranges must be stabilized after selecting a different voltage.

4) Rotate the MULTIPLIER switch clockwise until the megohmmeter scale indicates a reading preferably on the lower portion of the scale (to the right of the center of the scale)

5) If the TEST VOLTAGE is on a red position, read the resistance off the red arc of the megohmmeter scale. The black arc should be read if the TEST VOLTAGE setting is black.

6) The resistance of the test sample in megohms equals the megohmmeter reading multiplied by the MULTIPLIER switch indication of the corresponding arc (500 volts equals X1 to X5).

7) After the reading has been taken, rotate the TEST VOLTAGE switch OFF. This will automatically discharge any capacitive component connected to the measuring terminals, such as cables or capacitors.

SPECIAL OPERATIONS

This section describes the step-by-step procedures required to perform special operations incidental to the major functions described in the preceding pages.

ZERO SHIFT ADJUSTMENT

The zero shift on the meter scale should be checked periodically to prevent meter bounce and ensure accuracy. The high and low ranges must be stabilized before adjusting the zero shift. The back panel must be removed for access to the R4 potentiometer (use a non-metallic screwdriver). The MULTIPLIER and the TEST VOLTAGE should be set on the lowest range positions. The MULTIPLIER should be raised to the highest range. If the meter shifts in either direction, adjustment can be made with the R4 potetniometer. The MULTIPLIER should be returned to the lowest setting and further adjustment made if necessary. Since the SET L and SET H controls interact with the R4, stabilizing calibration should be repeated until there is no zero shift.

RANGE CALIBRATION

The stabilizing calibration calibrates the megohmmeter against internal standards. However, this procedure does not check the standard resistors used in all ranges. If suitable standards are available, they may be used to check each range. Another method of calibration is to measure each multiplier on a suitable bridge. The standards should be measured at low voltage levels because no more than 0,5 volts is applied to these resistors when the megohmmeter is in use. When measuring, disconnect the megohmmeter from the power line. To measure the standard multiplier resistors, set the multiplier switch to each of the six ranges from lowest to highest range. The TEST VOLTAGE switch should be set on either 50V, 100V, 500V or 1000V. Measure between the GUARD and NEGATIVE terminals. The values of the resistances should be 1000 ohm to 100 megohms in multipliers of 10, $\pm$ 1%, from lowest to highest multiplier range respectively except on the highest range where the tolerance is $\pm$ 2%.

PROBLEM	POSSIBLE CAUSE	RECOMMENDED SOLUTION
Erratic Output Voltage	a. Defective Zener. b. Bad diodes on the T-2 transformer.	a. Check the 50 + 100 Volt Zeners. b. Check the dc output across the R 21.
No L Calibration	a. Check vacuum tube. b. No voltage output. c. R19 or R-7 open.	a. Replace the tube. b. Ensure that Test Voltage selector switch is in position & Guard Circuit is properly connected. c. Replace appropriate resistor (s).
No H or L Calibration	a. Defective Zener. b. No filiment.	a. Check CR2-100V Zener. b. Check for 6 volts at points H & G.
Extreme Leakage	a. Dirty output bushing. b. Excessive Humidity.	a. Clean Neg. high voltage bushing. b. Select a drier test environment.

HIPOTRONICS

Exhibit A
SOP # 652

WARRANTY

HIPOTRONICS, INC. warrants to the original purchaser of any new merchandise that the merchandise is free from defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment. The obligation of Hipotronics, Inc. under this Warranty is limited, in its exclusive option, to repair, replace or issue credit for parts or materials which prove to be defective, and is subject to Purchaser's compliance with the Hipotronics, Inc. Warranty Claim Procedure as set forth below. The happening of any one or more of the following events will serve to void this Warranty and any defect or damage resulting therefrom is specifically excluded from Warranty coverage: (a) defects due to accident, negligence, alteration, modification, faulty installation by Purchaser or Purchaser's agents or employees, abuse or misuse; (b) attempted or actual dismantling, disassembling, service or repair by any person, firm or corporation not specifically authorized in writing by Hipotronics, Inc. (c) defects caused by or due to handling by carrier, or incurred during shipment, transshipment or other move.

This Warranty covers only those parts and/or materials deemed by Hipotronics, Inc. to be defective within the meaning of this Warranty. The liability of Hipotronics, Inc. shall be limited to the repair, replacement or issuance of credit for parts deemed defective within the meaning of this Warranty. Costs incurred by purchaser for labor or other expenses incidental to the inspection, repair, replacement or issuance of credit for such parts and/or material shall be the sole responsibility of purchaser. This Warranty shall not apply to any accessories, parts, or materials not manufactured or supplied by Hipotronics, Inc. and if, in the sole discretion of Hipotronics, Inc., Purchaser's claim relates to any materials or workmanship manufactured or performed by the supplier of a component part, or of the manufacturer of a device of which the defective part is a component, Hipotronics, Inc. reserves the right to disclaim liability under this Warranty and to direct that the Purchaser deal directly with such supplier or manufacturer. Hipotronics, Inc. agrees to assist the Purchaser in processing or settling any such claim without prejudicing its position as to liability.

WARRANTY CLAIM PROCEDURE Compliance with the following Warranty Claim Procedure is a condition precedent to the obligation of Hipotronics, Inc. under this Warranty:

(a) Purchaser must notify Hipotronics, Inc. in writing by certified or registered mail, of the defect claimed within twelve (12) months after date of original shipment. Said notice

WARRANTY CLAIM PROCEDURE (cont'd)

shall describe in detail the defect, the defective part, and the alleged cause of defect; (b) at the exclusive option of Hipotronics, Inc., Purchaser shall dismantle or disassemble at Purchaser's cost and expense and shall ship the defective part or material prepaid to Hipotronics, Inc., Brewster, New York 10509, for inspection, or permit an authorized service representative of Hipotronics, Inc. to inspect the defective part or material at Purchaser's premises. If Hipotronics, Inc. shall inspect the part or material at the Purchaser's premises, Purchaser shall provide facilities for, and at Purchaser's cost and expense, dismantle, disassemble, or otherwise make accessible the subject part or material whether or not same is a component of or installed in a device other than that manufactured or supplied by Hipotronics, Inc. If disclosure shows that the defect is not one for which Hipotronics, Inc. is liable, the Purchaser agrees to reimburse Hipotronics, Inc. for all expense incurred; (c) upon receipt of the defective part or material, or after access to same, Hipotronics, Inc. shall inspect the part or material to determine the validity of Purchaser's claim.

The validity of any Warranty Claim, Purchaser's compliance with Hipotronics, Inc. Warranty Claim Procedure, the obligation to either repair, replace, or issue credit, or direct the purchaser to deal directly with a manufacturer or supplier are to be determined solely and exclusively by Hipotronics, Inc. and any determination so made shall be final and binding.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED ON THE PART OF HIPOTRONICS, INC., INCLUDING THE WARRANTIES OF MERCHANTIBILITY AND FITNESS FOR USE, AND CONSEQUENTIAL DAMAGES ARISING FROM ANY BREACH THEREOF AND HIPOTRONICS, INC. NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON, FIRM OR CORPORATION TO ASSUME ANY LIABILITY OR OBLIGATION IN CONNECTION WITH THIS SALE ON ITS BEHALF AND PURCHASER ACKNOWLEDGES THAT NO REPRESENTATIONS EXCEPT THOSE MADE HEREIN HAVE BEEN MADE TO PURCHASER.

9/17/71

RETURNED MATERIAL

If, for any reason, it should become necessary to return the equipment described in this publication to the factory, the Warranty Service Department of HIPOTRONICS must be contacted, at which time the following data must be given in order that we may identify the unit and determine the necessity for return. (Tel. 914-279-8035) MODEL, SERIAL NO. and TYPE (Part No.) is indicated on the black and silver tag affixed to the unit.

MODEL:
SERIAL NUMBER:
TYPE (Part No.):
REASON FOR RETURN:
DEFECT:
ALLEGED CAUSE OF DEFECT:

If HIPOTRONICS deems return of the unit appropriate, an "Authorization for Return" tag will be issued. This will instruct you as to the method of return. The pink copy is for your records, the hard copy to be affixed to the unit being returned. If return is not deemed advisable, other inspection arrangements will be made.

NOTE: Material received at this plant without the proper authorization shall be held as "customer's property," with no service performed until such time as the proper steps have been taken.

Your cooperation is requested in order to ensure prompt service. Thank you.

PARTS ORDERING

To order replacement parts for this unit, please refer to the Parts List contained in the pocket of this publication. The number of the specific component is required, along with the TYPE (Part No.) of the unit. The TYPE (Part No.) is indicated on your Parts List, and on the black and silver tag affixed to the unit.

READER'S COMMENT FORM

Your comments on this publication will help improve its usefulness; this form will be sent to the author's department for appropriate action. Please do not use this form to request technical assistance or additional publications, as this will only delay response. *For more direct handling of such requests, please contact your Hipotronics representative or the Hipotronics Service Department [Tel. 914-279-8035].*

How did you use this publication?

- ☐ For general information
- ☐ As a text (student)
- ☐ For reference purposes
- ☐ As a text (instructor)
- ☐ For another purpose (explain) _____

_____

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ADDENDUM

* Better than 2% accuracy on all readings below 1 million megohms, with 3% up to 20 million megohms.